

Request for Reconsideration
U.S. Patent Application No. 09/978,186

REMARKS

Claims 1-64 are pending in the subject application: claims 1-56 and 58-64 stand rejected, and claim 57 is indicated as containing allowable subject matter. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the following remarks.

Claims 1-56 and 58-64 stand rejected under 35 U.S.C. §102(e) as being anticipated by Cangiani (U.S. Patent Publication No. 2002/0075907). Applicant respectfully traverses this rejection for the following reasons.

The invention relates to a technique for simplifying the interplex modulation scheme shown in Fig. 8 of U.S. Patent No. 6,335,951 to Cangiani et al. (the Cangiani patent). This figure is identical in all respects to Fig. 4 of the Cangiani publication relied upon by the Examiner to reject the independent claims. The important differences between the simplified approach of the present invention and the approach shown in Fig. 4 of the Cangiani publication relied upon by the Examiner are explained at length in Applicant's specification, and each of the independent claims was carefully drafted to clearly distinguish over Cangiani, as will now be explained in detail.

Interplex modulation is a technique for generating a constant envelope composite signal by combining a plurality of digital signals. As seen in Fig. 1 of the subject application (and Fig. 3 of the Cangiani publication), the known equation that governs combining three digital signals by interplex modulation includes four terms: three terms that each include one of the three digital signals multiplied by either the in-phase component of the RF carrier $\cos(\omega t)$ or the quadrature component of the RF carrier $\sin(\omega t)$, and a fourth term called the intermodulation product that involves all three digital signals.

As explained in the background section of the subject application (page 4, line 22 – page 5, line 21), Cangiani's system includes a waveform generator that individually generates the three digital signal components and the intermodulation product as binary signals. These four signals are respectively fed to four separate BPSK modulators which modulate either the in-

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phase or quadrature component of the RF carrier. The outputs of these modulators are scaled using four respective variable attenuators to achieve the desired relative power ratios among the four signal components, which are controlled by gain constants β_1 and β_2 . The attenuator gains are varied only if the power ratios among the three digital signals being combined are to change. The four components are then summed to form the composite signal. This is the configuration shown in Fig. 4 of the Cangiani publication, which is relied upon by the Examiner to reject the independent claims.

The present invention essentially performs the same operation using only two modulators and two attenuators rather than the four modulators and four attenuators required by the implementation in the Cangiani publication. Basically, the carrier signal is modulated with two modulation “legs” (one each for the in-phase and quadrature components) rather than the four modulation legs suggested by the interplex modulation equation. This improvement results from the inventor’s realization that the interplex modulation equation can be re-written into an expression having two components, one for each component of the RF carrier. By mathematically manipulating the two components of the expression, it was determined that, in the case of combining three signals, each carrier component takes on one of two phase states and one of two amplitude states, depending upon the instantaneous binary values of the three signals being combined. Consequently, the interplex modulation can be implemented using a single BPSK phase modulator and a single attenuator in each “leg,” where the gain of the attenuator is controllable between two states as a function of the instantaneous values of the three signals.

Consequently, a fundamental difference between the implementation of the present invention and that of the Cangiani publication is that the states of both the phase modulator and the variable attenuator in each modulation leg are controlled in accordance with the values of the digital signals being combined. As explained in paragraphs [0046] and [0047] of the Cangiani publication, the variable attenuators in the Cangiani publication are “variable” in that the gain can be adjusted in accordance with changes in the values of gain constants β_1 and β_2 , which are adjusted each time the relative power of the digital signals is to be changed (note the input of “digital words 6 bits” in Fig. 4 of the Cangiani publication). However, the states of the variable

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attenuators in the Cangiani publication are never controlled or adjusted in accordance with the values of the digital signals being combined. The attenuation levels remain fixed during the period of time that the values of constants β_1 and β_2 remain the same, irrespective of the values of the digital signals being transmitted.

This fundamental difference between the present invention and the scheme described in the Cangiani publication is quite clearly reflected in each of the independent claims. For example, independent claim 1 sets forth a method of combining a plurality of digital signals to form a composite signal for transmission. The claimed method includes: modulating the phase and amplitude of a first component of a carrier signal by controlling a state of a first phase modulator and a state of a first variable attenuator in accordance with values of the digital signals; modulating the phase and amplitude of a second component of the carrier signal by controlling a state of a second phase modulator and a state of a second variable attenuator in accordance with values of the digital signals; and combining the first and second components of the carrier signal to form the composite signal. Independent claims 16, 35, and 54 included comparable limitations. There is no disclosure or suggestion in the Cangiani publication to control the state of a variable attenuator in accordance with the values of the digital signals being combined in the composite signal. The Cangiani publication quite clearly explains that the variable attenuators in Fig. 4 are adjusted only in accordance with changes in the values of constants β_1 and β_2 , which have nothing to do with the values of the digital signals being combined in the composite signal (for a more detailed description of the role of constants β_1 and β_2 see Applicant's specification beginning at page 9, line 5). It is this fundamental difference that permits the present invention to be implemented with two modulation "legs" rather than the four modulation "legs" required by the implementation shown in Fig. 4 of the Cangiani publication. Thus, for the foregoing reasons, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of claims 1-56 and 58-64.

The Examiner indicates that claim 57 would be allowable if rewritten in independent form to include all of the limitations of its parent claims and any intervening claims. The Examiner is requested to hold in abeyance the requirement of rewriting of claim 57 in

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independent form, until the Examiner has had an opportunity to reconsider (and withdraw) the rejection of parent claim 54 under 35 U.S.C. §102 (e).

In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1-64. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Applicant hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,



Patrick J. Finnegan
Registration No. 39,189

EDELL, SHAPIRO & FINNAN, LLC
1901 Research Boulevard, Suite 400
Rockville, Maryland 20850-3164
(301) 424-3640
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